STRATEGIC AIR COMMAND

STATEMENT OF NEED (SON)

POSITIVE VERIFICATION OF
MINUTEMAN MISSILE ENABLE CODING

SAC SON 023-87 10 MAY 1988

HEADQUARTERS
STRATEGIC AIR COMMAND

Offutt Air Force Base, Nebraska

10 MAY 1988

HQ SAC/XPQ
SMS Cannon
AV 271-6236
COMM 402-294-6236

SAC 023-87 Statement of Operational Need (SON),
Positive Verification of Minuteman Missile Enable Coding

I. Mission.

A. Mission Area. USDRE 110 - Strategic Offense.

B. Joint Service/Multinational Applicability. None.

C. Mission Element Need. The need exists to ensure missile launch control through correctly loading enable codes into the Minuteman ICBM missile with extremely high confidence.

II. Basis of Need. Proper installation of the enable code into the Minuteman missile is essential for missile launch. A need to verify enable code installation has arisen through recent detection of incorrectly coded command signals decoders - missile (CSD-Ms). On two occasions, CSD-Ms were found to contain the previous revision of the enable code. Examination of the equipment involved could not produce a definite fault or a design susceptibility that would allow undetectable failure of the CSD-M coding process. Personnel performance was examined and personnel error could not be positively proven. However, in one instance, personnel error is the most probable cause of incorrect CSD-M coding. Whatever the error source, once it occurs, the system cannot identify the error until another coding is attempted. Requires: Computer Program Verification, Surface-to-Surface missile launching, (redo)

III. Assessment of Capabilities.

A. Existing Capabilities.

1. Successful missile coding is not verified by an end-to-end check, i.e., a separate direct comparison of the installed code with the source code. Rather, verification is an incremental process based on the successful completion of several coding tasks. These three tasks are: (1) preparation and verification of the code change verifier (CCV) at the support base; (2) CSD-M coding at the missile; and (3) reverification of codes and CCV upon return to the support base. Each task stands alone without linkage to another except for the task 3 reverification of codes installed in task 1.

2. Successful completion of each coding task relies almost exclusively upon the performance of the many equipment operators. Tasks one and three are performed and documented by two separate operations code teams at the support base on the Code Inserter Verifier (CIV) or ICBM Code Processing System (ICPS). The remaining task, task two, is performed by a maintenance code team at the launch facility. An undetected malfunction or omission in any of these tasks can invalidate the entire coding process.

3. Verification of operator performance relies on review of task documentation. CIV coding and CSD-M coding at the launch facility are documented by operator hand scribed records. Coding on the ICPS improves task documentation by providing a printout of task completion, faults, and critical task data. Review of this documentation is inadequate to provide the confidence in successful task completion that is required.

B. Planned/Programmed Capabilities. All existing CIV equipment is being replaced with the ICPS. No improvements to the ICPS hardware or software are currently programmed.

IV. Needed Capability.

A. General Operational Requirements.

1. Operational Capability. A capability must be provided to properly code the CSD-M with 99.9 percent effectiveness (999 successful codings out of 1000). The capability must link all three tasks of CSD-M coding and provide comparison/traceability of the resident CSD-M code to the original source information (NSA master code data). This must be accomplished without initiating an enable command or affording the operators or maintainers the opportunity to view operational codes. The new capability should stress human engineering to eliminate or limit human error rather than relying on error-free operator performance to achieve the required confidence level. Security for code values shall be equal to current standards with increased security very desirable. Operational nuclear certification (by the user) must be no more difficult than the current equipment. Operation of the new capability shall require no more than a ten percent increase in coding time lines. Existing coding and maintenance equipment and facilities shall be used to the maximum extent possible to reduce modification impact on the weapon system.

2. Reliability. The new capability shall have a minimum mean-time-between-failure of 500 hours with a design goal of 1000 hours. This is based on an average coding operation time of 10 minutes. New equipment or added capabilities to existing equipment shall not adversely affect coding reliability.

3. Maintainability. Service and repair of the new capability shall be possible within the current Minuteman organizational and intermediate maintenance structure. Repair shall consist of fault isolation to a line replacement unit (LRU). Mean-time-to-repair shall not exceed one hour.

4. Supportability. Parts and materials to support the new capability shall be available for the life of the Minuteman weapon system--currently projected well beyond the year 2000. The capability shall be supportable from the weapon system operating locations by the various levels of organizational and intermediate level maintenance.

5. Readiness. The new capability must sustain an emergency code change demand (200 coding operations within 48 hours at a single operating location) and the yearly code change demand (50 coding operations within 48 hours) at all operating locations.

6. Mobility. Any new hardware for use at the launch facility must be suitcase modular and within current weapon system handling restrictions for man-carry and equipment lowering.

7. Survivability. Any new hardware must be sufficiently rugged to accommodate extended transport in a truck bed without special protection provisions. Hardware must withstand non-operating temperatures of -50 to +150 degrees Fahrenheit and an operating temperature of +35 to +110 degrees Fahrenheit.

B. Possible Solutions. None.

V. Proposed Program.

A. Acquisition Strategy.

(1) Full and open competition will be pursued during all program phases. Lowest Evaluated Price (LEP) techniques will be utilized during contract award evaluation.

(2) Contractual methods used: Concept definition - fixed price; Full-Scale Development (FSD) and production - fixed price incentive (firm target) award fee.

(3) The Operational Test and Evaluation (OT&E) program will include Qualification Operational Test and Evaluation (QOT&E) and potentially Follow-On Operational Test and Evaluation (FOT&E). HQ SAC will assist in development of the Test and Evaluation Master Plan (TEMP) and will conduct QOT&E and any FOT&E.

B. Schedule: Conception Definition Studies - Fiscal Year (FY) 88; Request for Proposal (RFP) - FY 88; FSD Contract Award (FY 89; QOT&E - FY 90; Nuclear Weapon System Safety Group (NWSSG) Review - FY 90; and Delivery - FY 90.

C. Funding Profile. Ogden ALC will combine the Positive Verification of Minuteman Missile Enable Coding SON with a separate initiative to replace the code change verifer for maintainability/ supportability. The combined program will be managed under Minuteman Squadrons funds. Funding for the combined program is detailed in attachment 2.

GEORGE W. LARSON, JR.
Brigadier General, USAF
Deputy Chief of Staff/Plans

2 Atch
1. Requirements Correlation Matrix
2. Program Decision Package (PDP)

POSITIVE VERIFICATION OF MINUTEMAN MISSILE ENABLE CODING

SAC SON 023-87

REQUIREMENTS CORRELATION MATRIX

PARAMETER	REQUIREMENT	SPECIFICATION	TEST CRITERIA
1. Operational Capability			
1.1. CSD-M code verification.	1.1. Compare/trace resident CSD-M code to original source data. (r)		
1.2. CSD-M coding verification confidence.	1.2. 99.9 percent confidence (r)		
1.3. Coding verification confidence mechanism.	1.3.1 Does not rely on error-free operator performance. (r)		
	1.3.2 No enable commands or operational code viewing by personnel. (r)		
1.4. Equipment operational nuclear certification.	1.4. Operational nuclear certification by user no more difficult than current equipment. (r)		
1.5. Code security.	1.5.1. Current standard. (r)		
	1.5.2. Increased security. (g)		

(g) = goal
(r) = requirement

Attachment 1

PARAMETER	REQUIREMENT	SPECIFICATION	TEST CRITERIA
1.6. Coding time.	1.6. No more than 10 percent increase. (r)		
1.7. Equipment configuration.	1.7. Maximum use of existing coding and maintenance equipment. (r)		
2. Reliability.			
2.1. Individual coding equipment.	2.1.1. MTBF of 500 hours. (r)		
	2.1.2. MTBF of 1000 hours. (g)		
2.2. Coding process.	2.2. Not degraded. (r)		
3. Maintainability.			
3.1. Maintenance concept.	3.1.1. Service and repair by existing Minuteman organizational and intermediate maintenance structure. (r)		
	3.1.2. Repair by fault isolation to a line replaceable unit (LRU). (r)		
3.3. Mean-time-to-repair.	3.3. 1 hour. (r)		
4. Supportability.			
4.1. Parts and material availability.	4.1. Project for well beyond the year 2000. (r)		

(g) = goal
(r) = requirement

PARAMETER	REQUIREMENT	SPECIFICATION	TEST CRITERIA
4.2. Operating location support level.	4.2. Organizational and intermediate level maintenance. (r)		
5. Readiness.			
5.1. Capability availability. availability.	5.1. Adequate to allow: 200 codings within 48 hours at single location and 50 codings within 48 hours at all operating locations. (r)		
6. Mobility.			
6.1. Launch facility hardware size and weight.	6.1. Within current weapon restrictions for man-carry and equipment lowering. (r)		
6.3. Handling.	6.3. Suitcase modular. (r)		
6.4. Survivability.	6.4.1. Ruggedized for truck bed transport without special protection. (r)		
	6.4.1. Nonoperating temperature - -50 to +150 degrees Fahrenheit. (r)		
	6.4.2. Operating temperature - +35 to +110 degrees Fahrenheit. (r)		

(g) = goal
(r) = requirement

THE FOLLOWING IS AN UNCLASSIFIED EXTRACT OF THE
11 APR 88 MINUTEMAN SQUARONS PROGRAM DECISION PACKAGE
TO SUPPORT SAC SON 023-87

PROGRAM DECISION PACKAGE #AFA112

MINUTEMAN SQUADRONS

RESOURCE IMPACT	FY 89	FY 90	FY 91	FY 92	FY 93	FY 94
PROGRAM ELEMENT 11231F						
CAFC/BC 3020/14 MISSILE PROCUREMENT	254.5	214.0	250.5	257.8	277.4	278.0
COST ELEMENT 21XXX MODIFICATIONS/UPDATES	73.194	35.674	78.162	81.994	97.567	93.149
COST ELEMENT 22XXX REPLENISHMENT EQUIP	49.851	57.387	51.692	54.709	55.967	57.533
COST ELEMENT 26XXX INITIAL SPARES	0.508	0.525	0.538	0.551	0.564	0.580
CAFC/BC 3400/30 OPERAT & MAINT AF	151.2	175.0	178.2	180.6	197.9	205.7
COST ELEMENT 02XXX TRAVEL OF PERSONS	0.793	1.082	1.095	1.121	1.145	1.178

TOTAL SAC SON 023-87 IMPACTS	12.256
CAFC/BS 3020/14	11.942
COST ELEMENT 21XXX MODIFICATIONS/UPDATES	1.000
COST ELEMENT 22XXX REPLENISHMENT EQUIP	10.550
COST ELEMENT 26XXX INITIAL SPARES	0.392
CAFC/BS 3400/30	0.020
COST ELEMENT 02XXX TRAVEL OF PERSONS	0.020
CAFC/BS 4921 PROVISIONING (NOT MM SQUADRONS)	0.294

ATTACHEMENT 2

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FOR SAC SON 023-87

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/LEEX	1 (I)
/LEYM	1 (A)
/LEYY	5 (A)
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